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ABSTRACT

The nature of dyslexia is defined and reviewed in the context of neurological and educational processes and the nature of a written language system. An illustrative case history of a typical dyslexic child is presented. The nature of a script system is examined in the light of current linguistic and psycholinguistic studies. Noted are characteristics of the rule governed written language system such as scriptphonetic relationships. Stressed is the interface between the language system and maturational factors including unidirectional sensory and motor modes of perceiving. The incidence of dyslexia is related to the probabilities of individual differences in lateralization of brain function. It is concluded that dyslexia can be regarded as a primary difficulty based on the incompatibility between the written language system itself and the intrinsic developmental skills of an individual's perceptual motor system. (DB)

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DYSLEXIA AS A PHENOMENON OF WRITTEN LANGUAGE

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Abstract

Dyslexia as a concept is defined and reviewed in a context of neurological and educational processes. In the present investigation these processes are recognised but emphasis is placed on Dyslexia as a phenomenon of a written language system. An illustrative case history is presented.

The type of script system involved in the phenomenon is that of an alphabetic code representing phonological elements of language in script form related to meaning. The nature of this system is viewed in the light of current linguistic and psycholinguistic studies. These studies based as they are on an analysis of underlying written language structures provide a framework for examining the arbitrary and rule governed system which a young child is expected to acquire. There appear to be fundamental implications for reading, spelling and writing processes; for example an alphabetic system requires recognition of consistent script-phonetic relationships, mediated word identification and in particular unidirectional sensory and motor modes of perceiving. These are critical maturational factors in the young learner.

The skills needed by the child for decoding and encoding such a phonemic script are described in a psychological and neuropsychological framework. Evidence for individual differences in these skills is noted and the category of the dyslexic-type learner emerges. Incidence is related to the probabilities of individual differences in lateralisation of brain function not favouring the acquisition of our script system in some cases. Dyslexia is therefore regarded as a primary difficulty consequent upon the incompatibility between the written language system itself and the intrinsic, developmental skills of an individual's perceptual/motor system.

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DYSLEXIA AS A PHENOMENON OF WRITTEN LANGUAGE

Dyslexia has been defined by the World Federation of Neurology (1968) as "a language disorder in children, who despite conventional classroom experience, fail to attain language skills of reading, writing and spelling commensurate with their intellectual abilities."

Neurologists have in fact recognised a category of difficulties in acquiring written language form for at least 100 years. The word Dyslexia was originally used by Kussmal (1878) to describe the phenomenon. The neurologists base their theory on knowledge of the brain and the differential functioning in the two cortical hemispheres. It has been known since Broca (1856) that the left cortical hemisphere has a pre-eminence for processing language, Orton '37 and others have related this to 'cerebral dominance' to the dyslexic.

In recent years however confusion has arisen between educationists and neurologists owing to the use by the latter of the term 'word blind' as a synonym for Dyslexia. To the educationist this term represents an irretrievable, irremediable situation which they cannot accept. Most learning failure has been attributed during the last thirty years or so to environmental influences such as deprived linguistic background, emotional disturbance, and inadequate teaching. The difficulties of the slow-learning child, or the child with gross neurological defect have of course been recognised and provisions made for special education in such cases. However, the high incidence of general illiteracy in both this country and the United States is a constant feature of educational reports, varying from 4 - 30% of school populations.

Current attention is increasingly focussed on an emerging pattern of symptoms in many of the so-called illiterates; and some specialists are looking again at the neurologists' theories of dyslexia. In America the symptoms are often described as 'soft neurological signs'. The following case-study is typical of this clinical syndrome:

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John was referred to the Clinic as a poor reader when he was nine years old. His written work was marked by reversals, mirror-image writing, omissions, random use of capital letters; no punctuation and bizarre spellings. His parents were both professional workers - father was a University lecturer in mechanical engineering and mother taught design at the local College of Art. He had a sister eighteen months younger who was doing well at school, except that spelling was still difficult for her. She was left-handed. An older brother was at a Grammar-technical school doing well in science and technical drawing, but finding modern languages and fluent written expression quite difficult.

There had been no apparent pregnancy or birth difficulties and milestones had been well within the normal range. Spoken language however was late in developing and John was nearly three years before he started to speak at all fluently. Parents noticed his early ability in spatial/manual tasks such as jigsaws and formboards. John seemed curious, lively and intelligent, and infact when tested at the Clinic was found to be in the superior range of ability with oral/receptive vocabulary three years in advance of his chronological age. Reading and spelling and written expression however were three years retarded. When assessed in psycho-linguistic skills, some difficulties were noted in visual sequential memory, and more severe problems in auditory sequential memory. Sound blending also presented some difficulties.

John had an inconsistent laterality pattern, e.g. he wrote and cut with his right hand, but dealt cards, threaded a needle, threw a ball and screwed a lid with his left. He had not established complete eye-dominance, but favoured his left eye in binocular viewing. He was also left-eared. The family pattern of laterality was also mixed: father was ambi-dextrous and

right-eyed; whereas mother was right handed but left-eyed. There was a high incidence of left-handedness in both families. Father had been slow in learning to read but at nine years had made sudden progress and won a place at Grammar School. Mother attended Art School, but was poor at spelling and written fluency.

Recently it had been noticed that some secondary emotional difficulties were interacting with John's reading problems and he was withdrawing from any involvement in school activities. At home he was quiet and often near to tears. The above case illustrates some of the problems arising in Dyslexic children. Since the Education Act of 1870 there has been great emphasis in research and training of written language skills; but always it would appear that the assumption is being made that every child upon reaching the chronological age of 5 years will almost automatically acquire the skills of a graphic script representing spoken language. The main approach has been concerned with teaching method; whereas little attention has been given in practice to the fundamental issues involved. These are the probabilities of transmitting a written language system to children each with their own levels of perceptual development at the statutory age of 5 years. Higginbotham (1971) staes that: "By the end of their third of fourth year most children have mastered the basic grammatical devices and structural patterns involved in the utterance of their language, and by the fifth or sixth year have sufficiently stabilized the rule system so that they are able to control many of the inconsistencies and complexities of their language."

This refers to the spoken language which is probably coeval with man himself; possibly as Lenneberg (1967) suggests is rooted in biological foundations. Written language on the other hand is a human skill with a history of only three to four thousand years. This system is man-made, characterised by rules,

regularities, order, direction and sequence. Therefore it cannot be assumed that the skills required for learning this system are innate or genetically determined. Such a complex skill would appear to need elaborate organisational networks in the brain, and it is the individual differences in these patterns which may result in a percentage of people not being adecuately prepared to acquire written language at such early ages.

Thus the acquisition of written language can be viewed as an interaction between the child's own skills, and the skills required for written language itself.

We shall begin by looking at some of the features of written language, and spell out the implications of this system to the child, and to the acquisition of written language after this analysis.

One of the first points to be recognised and pointed out by linguists is of that/the primacy of spoken language, which as Lenneberg suggests can be viewed as the "first symbol system". In simple practical terms this means that children acquire an oral vocabulary before proceeding to a written language.

Written language itself is of course alphabetic (as opposed to a pictograph system); phonemes are represented by arbitrary graphemes (in the English language comprising only twenty-six symbols). An illustration of this is given by Bloomfield (1942):

> "As an illustration we may take the written representation of the word pin. It consists of three characters, and each of these three represents a single phoneme. If anyone told us to use these three characters to represent the word needle, we should find the suggestion absurd, because these characters do not fit the sound of the word

> needle. That is, each of three characters, pin, is used conventionally to represent a unit sound of our language. This appears plainly if we compare the written symbols for other words, such as pig, pit or bin, din, or pan, pun, or if we reverse the order of the letters and read nip.
>
> "The alphabetic nature of our writing appears most plainly of all, however, when we put together a combination of letters that does not make a word and yet find ourselves clearly guided to the utterance of English speech-sounds; thus nobody will have trouble in reading such nonsense-syllables as nin, nip, lib."

Our system then is not a picture writing system, or a pictogram (word writing)system, but a symbolic one in which the graphemes are unrelated to the actual event in the environment. This alphabetic system is then expanded into word patterns and also spelling patterns,or as Fries (1962) calls them, sequences of phoneme contrasts and sequences of grapheme contrasts respectively. Each language has its own permitted patterns (digrams, trigrams) which must be learned as arbitrary rules of the system, e.g. ing, and, ch. At another level it has been pointed out by many linguists that there is no direct relationship between surface structure and meaning, and in written language one therefore has the distinction between word (or letter) identification and reading for comprehension. Smith (1973) describes 'mediated word identification' in which the composite letters are discriminated, and the sound of the word is built by the phonic/spelling rules, and 'immediate word identification' in which the marks on the paper are transposed into meaning directly. He suggests the former process is used by learners, and the latter by fluent readers. The problem for the learner therefore is the question of what are the distinctive features for discriminating the inkmarks. Some are more similar than others, e.g. b d h or nv. Furthermore many of these ink marks are directional, mirror-imaged or transposable - p,q b,d m,w u,n. (The environmental event represented by the word however remains the same whether turned around, upside down, etc. or not, whereas our symbol system changes its meaning.) (2)

An extension of this, and relating to the points made on word and spelling patterns is that written language is sequential; letters and words being put into a sequence and a correct order. Thus the distinctive features or constituent letters of cat and act, or was and saw are the same, and therefore the differences relate to meaning, rather than perceptual features. Smith (1973) suggests that the fluent readers are moving from meaning to the surface structure, whereas the beginner moves from surface structure to meaning.

These then are some of the features of the task confronting the young child of 5 years (statutory age for beginning school). Symbols must be related to an event, and perceived, stored and reproduced consistently in visual, auditory and motor activities. This therefore leads to an examination of the child's skills with respect to this system.

The developmental patterns of learning in the young child are immature. The perceptual and integrative systems fundamental to learning are not necessarily developed in such a way as to organise the written language system which society imposes. Intrinsic and extrinsic factors interact to produce each individual child with his or her own individual skills. Some of these skills derive from the underlying neurological and brain functions involved in the development of these skills (and of course these interact with environmental influences). Thus the sensory and motor mechanisms resulting from these underlying features are reflected differently in each child.

The teacher's role as far as written language is concerned, is to establish whether the child's skills relate to the task which is presented. Is the child perceiving the directional, sequential nature of the language, visually and aurally? Can the child retain, or reproduce these features? Is the child's motor coordination mature enough to reproduce our graphical system, or to be

fluent in a left-right direction? Are these sensory and motor mechanisms (eye, ear, hand) able to integrate and perform the subtasks in this unidirectional, ordered system? Can the child cope with the concepts involved in relating arbitrary symbols to a concrete event? These are the types of questions to ask when investigating the intrinsic skills which the child brings with him to the task of reading, spelling and writing.

The nature of written language and the skills needed by the child interact as a kind of interface, which may be represented graphically (see figure 1). The dyslexic child, we would hypothesise, is at the stage of the beginner learner, where 'mediated word recognition' is required. The evidence indicates that the very skills that are required for written language are not those which are possessed by the dyslexic-type learner. (Naidoo 1972, Bannatyne 1971, Newton 1971).

The dyslexic is characteristically confused over direction, particularly of left/right orientations. Visual and auditory sequential memory tends to be poor - he cannot remember and produce symbols and sounds in sequence. Sound blending is often weak - he cannot put phonemes together to make words. These skills are of course critical in the acquisition of our symbol system, without which 'mediated word recognition' can never reach the stage of reading for meaning - something which the dyslexic is conceptually perfectly able to do. These interactions between the child's skills and the written language therefore produces the clinical manifestations of dyslexia - the disordered pattern of words, reversal of letters, 'bizarre' spelling, difficulties in relating sound to symbol, etc. Different written systems might not produce difficulties of this nature, but only a script system involving an alphabetic, phonemic code. Recent evidence looking at Japanese scripts is supportive of this. Makita (1974) describes two types of script - Kanji, which is a pictogram system, carrying the meaning at once (as Smith suggests fluent

readers do with our system) and Kana, which is alphabetic. Dyslexia is reported as being of much higher incidence in children who are taught the Kana script, with the same clinical features reported. It would appear that future work in this field could usefully pursue two areas of study:

1) the implications of differential functioning in the brain - a task for the neuropsychologist. 2) a deeper investigation of the fundamentals of written alphabetic script form and the consequent effect upon the acquisition of such scripts - ~~this would be a task for the applied linguistic~~.

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TABLE 1 The interaction between child and written systems

Written language	INTERFACE	Skills required in child of 5 years
Primacy of spoken language		Level of language usage
Alphabetic system		Conceptual framework for a 'symbol' Perception of unit speech sounds and symbols used for these
Word patterns (sequence of phoneme contrasts)		Perception and retention of sounds in order
Spelling patterns (sequence of grapheme ~~correspondence~~ combination)		Perception and retention of ordered symbols
Ordered nature of language		Phonemes produced in correct order Awareness of ordered events
Directional nature of symbols		Perception and retention of directionality
Practical execution of written language		Motor control and directional fluency
Total arbitrary, ordered, sequential, directional symbolic system		Sensory and motor mechanisms able to integrate these events hypothesised as being more efficient when related to unilateral brain function

Newton & Thomson 12

ction between child and written systems

INTERFACE	Skills required in child of 5 years	Attempted assessment by Index
nguage	Level of language usage	Vocabulary scale Picture recognition
	Conceptual framework for a 'symbol'	Mental age measures - Draw-a-man, copying designs
	Perception of unit speech sounds and symbols used for these	Phoneme/grapheme correspondence Sound discrimination
nce ts)	Perception and retention of sounds in order	Auditory sequential memory
equence ~~pendence~~)	Perception and retention of ordered symbols	Visual sequential memory (symbolic)
nguage	Phonemes produced in correct order	Sound blending
	Awareness of ordered events	Reproduction of common sequences (days of week, months of year)
f symbols	Perception and retention of directionality	Visual sequential memory (pictorial) Knowledge of left and right
of	Motor control and directional fluency	Graphomotor test Copying designs
ered, ional	Sensory and motor mechanisms able to integrate these events hypothesised as being more efficient when related to unilateral brain function	Laterality of eye, hand, ear, foot